MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2018/2019

PTM0145 – TRIGONOMETRY

(Foundation in Information Technology / Life Sciences)

7 MARCH 2019
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **TWO** pages excluding the cover page and the Appendix.

2. Answer **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

4. All necessary working steps **MUST** be shown.

Question 1 [10 marks]

a. Simplify and express $(4+2i)(5-3i)$ in the standard form $a+bi$.

(2 marks)

b. Express $z=(2-i)^2+\dfrac{7-4i}{2+i}-8$ in the standard form $a+bi$. (3 marks)

c. Convert the complex number $z=\sqrt{3}+i$ to the polar form. Hence, compute z^8 using De Moivre Theorem and leave your answer in the polar form.

(5 marks)

Question 2 [10 marks]

a. Find the vertex, the focus and the directrix of the parabola defined by $2y^2+8y+x+1=0$. Sketch the graph of the parabola.

(6 marks)

b. Given the center of an ellipse is (3,10), its vertex is (3, -3) and its focus is (3,5). Write the standard form of an equation of an ellipse based on the information given. (4 marks)

Question 3 [10 marks]

a. For the equation $y=-\dfrac{1}{2}(\cos 2x-2)$, identify the amplitude and period. Hence sketch the graph on the interval $0\le x\le 2\pi$.

(5 marks)

b. Solve the following equation for $0\le x\le 2\pi$:

$2\sin^2 x-3\cos x-3=0$ (5 marks)

Question 4 [10 marks]

a. If $\sin A=\dfrac{5}{6}$ and $\cos B=\dfrac{2}{7}$, where $\dfrac{\pi}{2}\le A\le\pi$ and $-\dfrac{\pi}{2}\le B\le 0$, find the exact value of

i. $\sin(A+B)$ (2 marks)

ii. $\tan 2A$ (2 marks)

b. Solve the triangle given that $a=19$, $b=16$ and $c=11$.

(6 marks)

Continued...

Question 5 [10 marks]

Solve the following linear system using the inverse method.

$$x + y - z = -3$$
$$2x - 3y + 4z = 23$$
$$-3x + y - 2z = -15$$

(10 marks)

End of Paper

APPENDIX

Trigonometry Identities

$$\cos^2 A + \sin^2 A = 1 \qquad \sec^2 A = 1 + \tan^2 A \qquad \csc^2 A = 1 + \cot^2 A$$

$$\cos(A+B) = \cos A\cos B - \sin A\sin B$$
$$\cos(A-B) = \cos A\cos B + \sin A\sin B$$
$$\sin(A+B) = \sin A\cos B + \cos A\sin B$$
$$\sin(A-B) = \sin A\cos B - \cos A\sin B$$
$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A\tan B}$$
$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A\tan B}$$

$$\cos 2A = \cos^2 A - \sin^2 A$$
$$= 2\cos^2 A - 1 = 1 - 2\sin^2 A$$
$$\sin 2A = 2\sin A\cos A$$
$$\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$$

$$\sin A\cos B = \frac{1}{2}\left[\sin(A+B) + \sin(A-B)\right]$$
$$\cos A\cos B = \frac{1}{2}\left[\cos(A+B) + \cos(A-B)\right]$$
$$\sin A\sin B = \frac{1}{2}\left[\cos(A-B) - \cos(A+B)\right]$$

$$\sin A + \sin B = 2\sin\frac{A+B}{2}\cos\frac{A-B}{2} \qquad \sin A - \sin B = 2\cos\frac{A+B}{2}\sin\frac{A-B}{2}$$

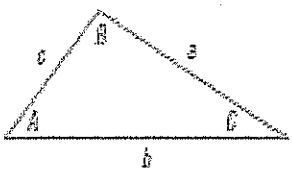
$$\cos A + \cos B = 2\cos\frac{A+B}{2}\cos\frac{A-B}{2} \qquad \cos A - \cos B = -2\sin\frac{A+B}{2}\sin\frac{A-B}{2}$$

$$\sin^2\frac{A}{2} = \frac{1-\cos A}{2} \qquad \cos^2\frac{A}{2} = \frac{1+\cos A}{2} \qquad \tan^2\frac{A}{2} = \frac{1-\cos A}{1+\cos A}$$

$$\sin\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{2}} \qquad \cos\frac{A}{2} = \pm\sqrt{\frac{1+\cos A}{2}} \qquad \tan\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{1+\cos A}}$$

$$\tan\frac{A}{2} = \frac{1-\cos A}{\sin A} = \frac{\sin A}{1+\cos A}$$

Triangles



Law of Sines:

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Law of Cosines:

$$c^2 = a^2 + b^2 - 2ab\cos C$$
$$b^2 = a^2 + c^2 - 2ac\cos B$$
$$a^2 = b^2 + c^2 - 2bc\cos A$$

Area of a Triangle: $A = \frac{1}{2}ab\sin C = \frac{1}{2}bc\sin A = \frac{1}{2}ac\sin B$

$$A = \sqrt{s(s-a)(s-b)(s-c)} \quad \text{where} \quad s = \frac{1}{2}(a+b+c)$$

Polar Coordinates

$$x = r\cos\theta$$
$$y = r\sin\theta$$
$$r = \sqrt{x^2 + y^2}$$
$$\tan\theta = \frac{y}{x}$$